

REMARKS

Claims 6, 8-11, 16, 18-21, 23, 27, 29, and 31-35 are pending in this application, with claims 6, 16, and 23 being independent. By this Amendment, claim 23 has been amended to correct an alleged minor informality.

For the following reasons, Applicants respectfully request reconsideration and withdrawal of all outstanding rejections in the Office Action dated December 29, 2004.

35 U.S.C. § 112, Second Paragraph, Rejection

In the Office Action, claim 23 is rejected under 35 U.S.C. § 112, second paragraph, as being indefinite, because the term “porous ceramic block” allegedly lacks sufficient antecedent basis. Although Applicants do not necessarily agree with the Office Action, Applicants have amended the term to read --first porous ceramic block--. Thus, Applicants respectfully request reconsideration and withdrawal of this rejection.

35 U.S.C. § 103(a) Rejection Based on Sagusa, Smith, and Niori

Claims 6, 8-11, 16, 19-21, 27, 29, and 31-34 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Japanese Patent Application Publication No. 09-165681 to Sagusa et al. (“Sagusa”) in view of U.S. Patent No. 5,600,530 to Smith (“Smith”), and U.S. Patent No. 6,101,969 to Niori et al. (“Niori”), according to the rationale provided in paragraph 5 of the Office Action. Applicants respectfully traverse this rejection and request reconsideration and withdrawal thereof.

Independent claim 6 recites a susceptor including, among other things, “a base metal made of a cast metal,” “a heater arranged on a plane,” “an upper ceramic-metal composite arranged above the heater,” and “a ceramic electrostatic chuck having an upper surface and a lower surface opposite the upper surface, the upper surface being

adapted to support an object to be processed thereon.” The upper ceramic-metal composite has an upper surface joined to the lower surface of the electrostatic chuck, and the heater and the upper ceramic-metal composite are cast in the base metal so that the upper ceramic-metal composite and the heater are embedded in the base metal while leaving the upper surface of the upper ceramic-metal composite exposed for joining to the lower surface of the electrostatic chuck. The upper ceramic-metal composite contains a ceramic material and a metallic material consisting of the base metal, and a mixing ratio between the ceramic material and the metallic material is determined so that the upper ceramic-metal composite has a coefficient of linear thermal expansion substantially the same as that of the electrostatic chuck.

Independent claim 16 recites a plasma processing apparatus including, among other things, a susceptor arranged in a processing vessel and having a similar structural configuration to that of independent claim 6.

The Examiner has the initial burden of presenting a *prima facie* case of unpatentability. To establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a), three basic criteria must be met. First, the prior art references when combined must teach or suggest all the claim elements. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Finally, there must be a reasonable expectation of success. See M.P.E.P. § 2143. Furthermore, case law in this context indicates that the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and that the evidence of a teaching, suggestion, or

motivation to combine must be “clear and particular.” As explained below, the Office Action’s alleged combination of Sagusa, Smith, and Niori fails to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a).

Regarding the first criterion, the Office Action’s proposed combination would not teach all the claim elements of claims 6 and 16. For example, none of the cited references discloses or otherwise suggests, among other things, a heater and an upper ceramic-metal composite being cast in a base metal so that the upper ceramic-metal composite and the heater are embedded in the base metal while leaving an upper surface of the upper ceramic-metal composite exposed for joining to a lower surface of the electrostatic chuck, wherein the upper ceramic-metal composite contains a ceramic material and a metallic material consisting of the base metal.

Sagusa discloses a cast heater plate 10, in which a sheathed heater 11 is embedded in a plate of aluminum ceramic composite 12. The entire surface of the aluminum ceramic composite 12, except its terminal, is covered with an aluminum rolled material 13. The aluminum ceramic composite is formed with a mixed powder containing 30~90 wt.% aluminum and 70~10 wt.% ceramic. The Office Action asserts that the sheath heater 11, the aluminum ceramic composite 12, and the aluminum rolled material 13 of Sagusa correspond to the recited “heater,” “upper ceramic-metal composite,” and “base metal,” respectively.

The aluminum ceramic composite 12, however, cannot correspond to the recited “base metal” because, among other reasons, it does not contain “a ceramic material and a metallic material consisting of the base metal,” as recited in claims 6 and 16. Instead, the composite 12 of Sagusa is formed of a mixed powder of aluminum and

ceramic materials, where the aluminum powder does not consist of the aluminum rolled material 13 (i.e., alleged by the Office Action to correspond to the recited “base metal”). Instead, the aluminum rolled material 13 and the aluminum powder in the aluminum ceramic composite 12 are separate and distinct from one another. None of the cited secondary references discloses or suggests this deficiency of Sagusa.

Moreover, the aluminum rolled material 13 of Sagusa cannot correspond to the recited “base metal” because, among other things, the sheathed heater 11 and the aluminum ceramic composite 12 are not cast in the aluminum rolled material 13. Instead, the aluminum rolled material 13 merely covers the heater 11 and the composite 12 by an isostatic pressing method. See claim 1 and paragraph [0014] of the translation provided by the Examiner. Despite this apparent distinction between the claimed invention and the teachings of Sagusa, the Office Action cited a portion of Applicants’ specification (i.e., “... when the core metal plate 90 is cast in aluminum, aluminum above and aluminum below the core metal plate 90 are bound together through the communication holes 92”) ¹ and, based on a clear misinterpretation thereof, alleged that “Applicant’s specification ... teaches aluminum as the ‘cast metal’” and that the aluminum rolled material 13 Sagusa is a cast metal merely because it contains aluminum.

Applicants respectfully disagree. The cited portion of the specification does not make any generalized statement that, if a metal contains aluminum, the metal is a cast metal. Instead, the cited portion of the specification merely describes, with reference to Figs. 5 and 6, that the core metal plate 90 is cast in a base metal of aluminum. See,

¹ Page 12, line 37 - page 13, line 2

e.g., page 8, line 24, and page 12, lines 32-37, of the specification. That is, regardless of whether the cast metal is aluminum or not, a metal becomes a cast metal only if it is formed by casting in a mold, not because it is formed of aluminum.

Pending claims in a patent application must be given their broadest reasonable interpretation consistent with the specification. In re Hyatt, 211 F.3d 1367, 1372 (Fed. Cir. 2000) (Emphasis Added). And, the broadest reasonable interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach. In re Cortright, 165 F.3d 1353, 1359 (Fed. Cir. 1999). The term “cast” or “cast metal” is a term of art and has a well-known meaning in the metallurgical art, which is consistent with the Applicants’ specification. For example, the term “cast” generally designates, as used in this case, a product or process in which the product is formed by pouring or injecting, for example, a liquid material in a mold to form a predetermined shape. Despite this well-known, ordinary technical meaning of the term, the Office has been attempting to distort the otherwise unambiguous meaning of the term, for no apparent reason, by introducing an unreasonable and improper interpretation that is inconsistent not only with the specification, but also with any reasonable interpretation that one of ordinary skill in the art would reach. The Examiner’s interpretation of the term “cast” without due regard to the ordinary technical meaning thereof is unreasonable and improper and should be withdrawn. When the terms “cast” and “cast metal” are construed in accordance with their well-known, ordinary technical meaning, it becomes apparent that Sagusa and other cited references do not disclose or suggest, among other things, “a heater and an upper ceramic-metal composite being cast in a base

metal so that the upper ceramic-metal composite and the heater are embedded in the base metal,” as recited in claims 6 and 16.

Furthermore, none of the cited references, taken either singularly or in combination, teaches or discloses, among other things, a heater and an upper ceramic-metal composite being cast in a base metal while leaving an upper surface of the upper ceramic-metal composite exposed for joining to a lower surface of the electrostatic chuck, as recited in claims 6 and 16. The Office Action admits that Sagusa does not teach “the upper surface (top 13’ Figure 4) of Sagusa’s upper ceramic-metal composite (12, “cordierite” (2MgO, 2Al₂O₃, and 5SiO₂), [0012]) is exposed for joining to an lower surface of an electrostatic chuck.” Nevertheless, the Office Action alleges that “the upper surface (58/54 interface) of Smith’s upper ceramic-metal composite (58; Figure 2; column 4; lines 30-45) is exposed for joining to an lower surface (58/54 interface) of an electrostatic chuck (54; Figure 2; column 4; lines 30-45).” Applicants respectfully disagree.

Smith discloses electrostatic chucks formed by bonding ceramic members with a layer of active braze alloy. As shown in Fig. 2, the chuck 46 includes a dielectric layer 50, an electrode 54, and a base 58. The electrode 54 is an active braze alloy, while dielectric layer 50 and base 58 are typically ceramic materials such as (but not limited to) alumina, silicon nitride, aluminum nitride, barium titanate, or calcium titanate. See col. 4, lines 31-38, of Smith.

The Office Action alleges that the base 58 and the electrode 54 correspond to the recited “upper ceramic-metal composite” and “ceramic electrostatic chuck,” respectively. The base 58, however, cannot correspond to the recited “upper ceramic-

metal composite” because, among other things, it is made of ceramic materials, as explicitly disclosed in col. 4, lines 36-37, of Smith. Moreover, even if the base 58 is made of a ceramic-metal composite material, Smith does not disclose or otherwise suggest that a heater and an upper ceramic-metal composite are cast in a base metal while leaving an upper surface of the upper ceramic-metal composite exposed for joining to a lower surface of the electrostatic chuck, as recited in claims 6 and 16. Instead, Smith merely discloses an electrostatic chuck formed by bonding ceramic materials with a layer of active alloy, with absolutely no teaching or suggestion of casting a heater or a ceramic-metal composite in a base metal while leaving an upper surface of the upper ceramic-metal composite exposed.”

With respect to claims 31 and 33, the Office Action alleges, for the similar reasons discussed above, that the aluminum rolled material 13 of Sagusa is in a form of a preformed porous block and is infiltrated with the base metal, as recited in claims 31 and 33, because the aluminum rolled material 13 is made of aluminum. As explained above, the aluminum rolled material 13 merely covers the outer surface of the composite 12 without any infiltration of materials therebetween. Therefore, the aluminum-metal composite 12 cannot be infiltrated with the aluminum rolled material 13, as recited in claims 31.

Worth noting is that, with respect to claim 29, the Office Action admits that “Sagusa does not teach: ... xiii. the plasma processing apparatus according claim 16, wherein the ceramic electrostatic chuck includes a ceramic base of a ceramic material (Al_2O_3) and a metallic electrode embedded in the ceramic base and adapted to generate an electrostatic force that attracts the object to be treated, as claimed by

claims 29.” The Office Action nevertheless rejects the claim without providing any explanation as to how this admitted deficiency of Sagusa is supplied by either Smith or Niori. To the contrary, neither Smith nor Niori discloses or suggests the deficiency of Sagusa.

For at least the reasons set forth above, the first criterion for a *prima facie* case of obviousness has not been met.

As to the second criterion, there is no suggestion or motivation in either Sagusa, Smith, or Niori to combine or modify the asserted teachings of the references in the manner proposed by the Office Action. The Office Action alleges that “[i]t would have been obvious ... to embed Smith’s electrostatic chuck to Sagusa’s upper, exposed, ceramic-metal composite ... and optimize the compositions for achieving thermal expansion matching.” The Office Action further alleges that “[m]otivation to embed Smith’s electrostatic chuck to Sagusa’s upper, exposed, ceramic-metal composite and optimize the compositions for achieving thermal expansion matching is for making a heated ceramic chuck that is durable as taught by Sagusa ([0012]), Smith (column 3; lines 1-3), and Niori (column 15; lines 1-16).”

The alleged motivation, however, does not provide any sufficient reasoning as to why one of ordinary skill in the art would have been motivated to embed Smith’s electrostatic chuck into Sagusa’s ceramic-metal composite. For example, making a durable chuck or optimizing compositions for achieving thermal expansion matching certainly does not require embedding an electrostatic chuck of Smith into a ceramic-metal composite of Sagusa. Nor does the embedding necessarily achieve a thermal expansion matching between the electrostatic chuck and the ceramic-metal composite.

In fact, the Office Action's proposed combination does not make any sense. For example, as discussed above, the aluminum rolled material 13 of Sagusa (i.e., alleged by the Office Action as corresponding to the recited "base metal") covers the entire surface of the aluminum ceramic composite 12 (i.e., alleged by the Office Action as corresponding to the recited "ceramic-metal composite") and, therefore, contrary to the Office Action's allegation, the aluminum ceramic composite 12 is not "exposed." And, removing the upper surface of the aluminum rolled material 13 to expose the aluminum ceramic composite 12 for embedding, or joining with, an electrostatic chuck would completely destroy the teachings of Sagusa because one of the main objects of Sagusa's invention is to prevent gas release from the aluminum ceramic composite 12 by covering the entire outer surface of the composite 12 with the aluminum rolled material 13. See, e.g., paragraphs [0005] and [0006] of Sagusa. Thus, the electrostatic chuck of Smith or any other electrostatic chuck cannot be embedded into or joined with the aluminum ceramic composite 12 of Sagusa.

Furthermore, Smith does not disclose how its electrostatic chuck 46 is heated or where a heater is located. Since the base 58 of Smith is made of a ceramic material (col. 4, lines 35-38), which has a much lower thermal conductivity than that of a metallic material, it is more than likely that Smith's electrostatic chuck 46 is heated by a heater arranged in the base 58. In addition, in view of the arrangement of the electrical feedthrough 62, it is more than likely that the base 58 is made of an electrically-insulative ceramic material. Sagusa's heater plate 10, however, is made of a material having a relatively high thermal and electrical conductivity. Therefore, one of ordinary

skill in the art would not have been motivated to replace the Smith's base 58 with the heater plate 10 or aluminum ceramic composite 12 of Sagusa.

As is abundantly clear, the Examiner's asserted motivation is a result of impermissible hindsight gleaned from the present application. When the references are viewed without such hindsight, one of ordinary skill in the art considering Sagusa, Smith, and Niori would not have been motivated to combine their teachings in the manner proposed by the Office Action, since there is no "clear and particular" reason to do so. For at least these reasons, Applicants respectfully submit that the second criterion for a *prima facie* case of obviousness also has not been met.

As to the third criterion, the alleged combination of Sagusa, Smith, and Niori does not show a reasonable expectation of success because, as discussed above, it does not make any sense. For at least this reason, the third criterion for a *facie* case of obviousness also has not been met.

For at least the reasons set forth above, Applicants respectfully submit that a *prima facie* case of obviousness under 35 U.S.C. § 103(a) has not been properly established. Thus, reconsideration and withdrawal of this rejection under 35 U.S.C. § 103(a) is respectfully requested.

35 U.S.C. § 103 Rejections Based on Hirano and Sagusa

Claims 23 and 35 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,120,661 to Hirano ("Hirano") in view of Sagusa, according to the rationale provided in paragraph 6 of the Office Action. Applicants respectfully note that Hirano is not a prior art because its filing date (i.e., June 7, 1999) is later than the priority date of this application (i.e., April 6, 1999). The status of Hirano has been

previously addressed by Applicants in the Amendment filed on May 6, 2003, to which the Office agreed in the Office Action dated August 1, 2003.

For at least this reason, Applicants respectfully request reconsideration and withdrawal of this rejection.

35 U.S.C. § 103 Rejections Based on Sagusa, Smith, Niori, and McMillin

Claim 18 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Sagusa, Smith, and Niori in view of U.S. Patent No. 5,835,334 to McMillin et al. ("McMillin"), according to the rationale provided in paragraph 7 of the Office Action.

Dependent claim 18 depends from independent claim 16. As discussed above, independent claim 16 patentably distinguishes from Sagusa, Smith, and Niori. Moreover, McMillin does not cure the deficiencies of Sagusa, Smith, and Niori. Therefore, dependent claim 18 should also be allowable at least by virtue of its dependency from allowable independent claim 16. Thus, reconsideration and withdrawal of this rejection is respectfully requested.

Conclusion

Applicants respectfully request the reconsideration of this application, the withdrawal of all the outstanding rejections, and the allowance of all pending claims.

The Office Action contains a number of statements and characterizations regarding the claims and the related art. Applicants decline to subscribe necessarily to any statement or characterization in the Office Action, regardless of whether it is addressed above.

The Examiner is invited to call the undersigned (571-203-2735) if a telephone conversation might advance prosecution of the application.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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